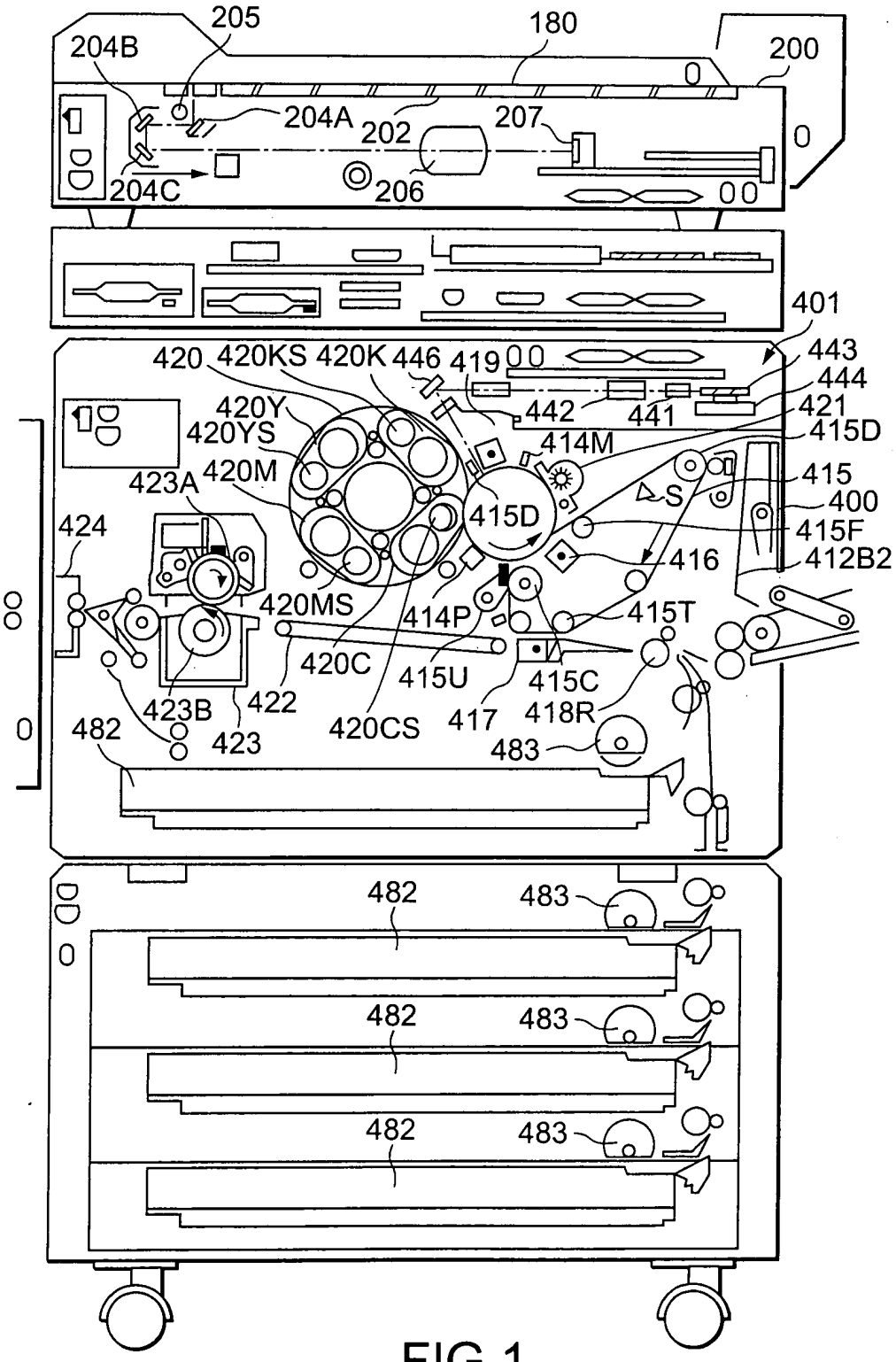

205
180
204B
200
204A
202
207
204C
206
401
420
420KS
420K
446
419
443
444
420Y
442
441
421
420YS
414M
415D
423A
420M
415
S
400
424
415D
415F
416
412B2
420MS
414P
415T
420C
415U
415C
423B
422
417
418R
420CS
482
423
483
482
483
482
483
482
483

FIG.1

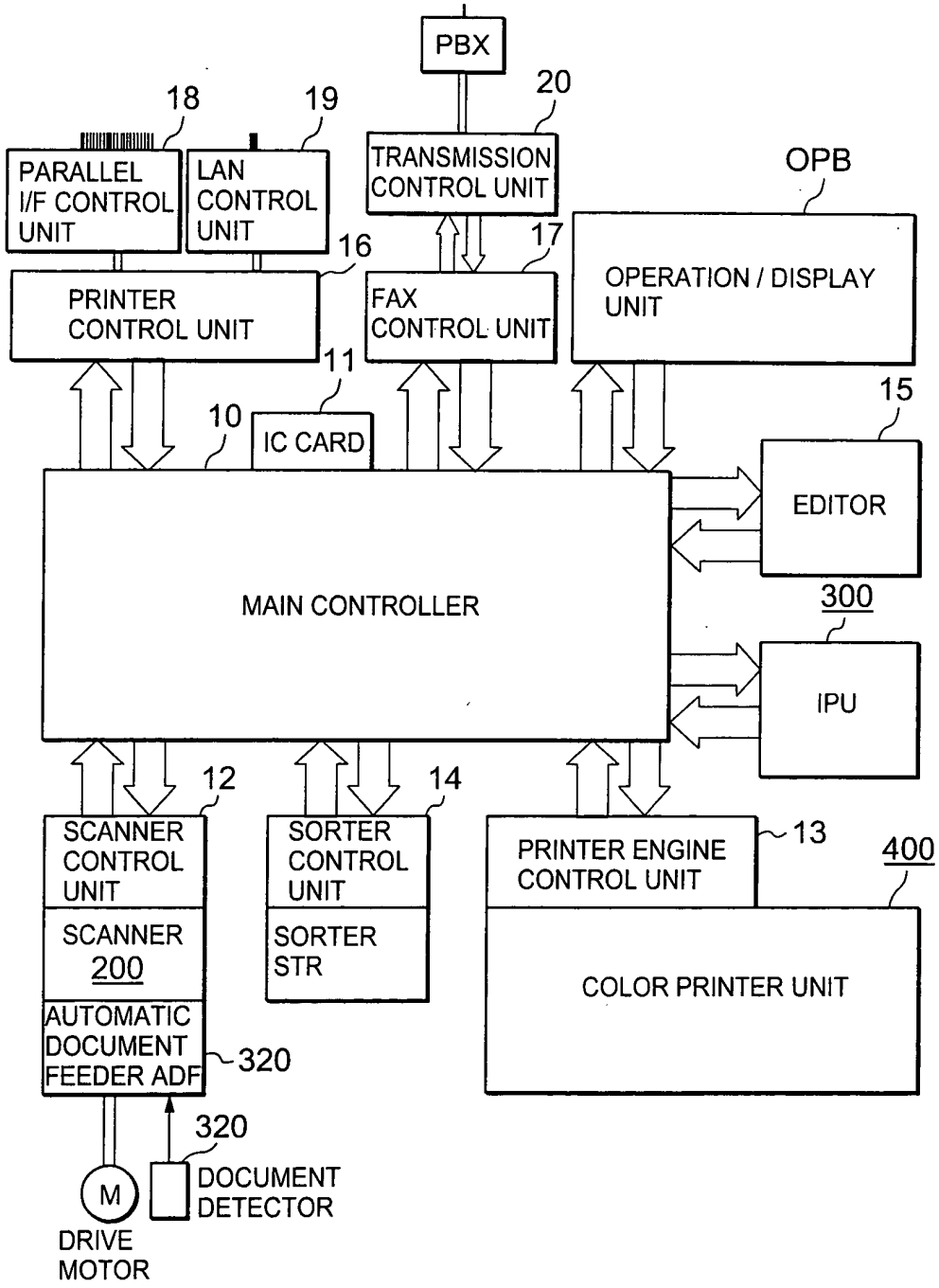

PBX
18
19
20
PARALLEL I/F CONTROL UNIT
LAN CONTROL UNIT
TRANSMISSION CONTROL UNIT
OPB
16
17
PRINTER CONTROL UNIT
FAX CONTROL UNIT
OPERATION / DISPLAY UNIT
11
15
10
IC CARD
EDITOR
MAIN CONTROLLER
300
IPU
12
14
13
400
SCANNER CONTROL UNIT
SORTER CONTROL UNIT
PRINTER ENGINE CONTROL UNIT
SCANNER 200
SORTER STR
COLOR PRINTER UNIT
AUTOMATIC DOCUMENT FEEDER ADF
320
320
M
DOCUMENT DETECTOR
DRIVE MOTOR

FIG.2

EP 1 922 860

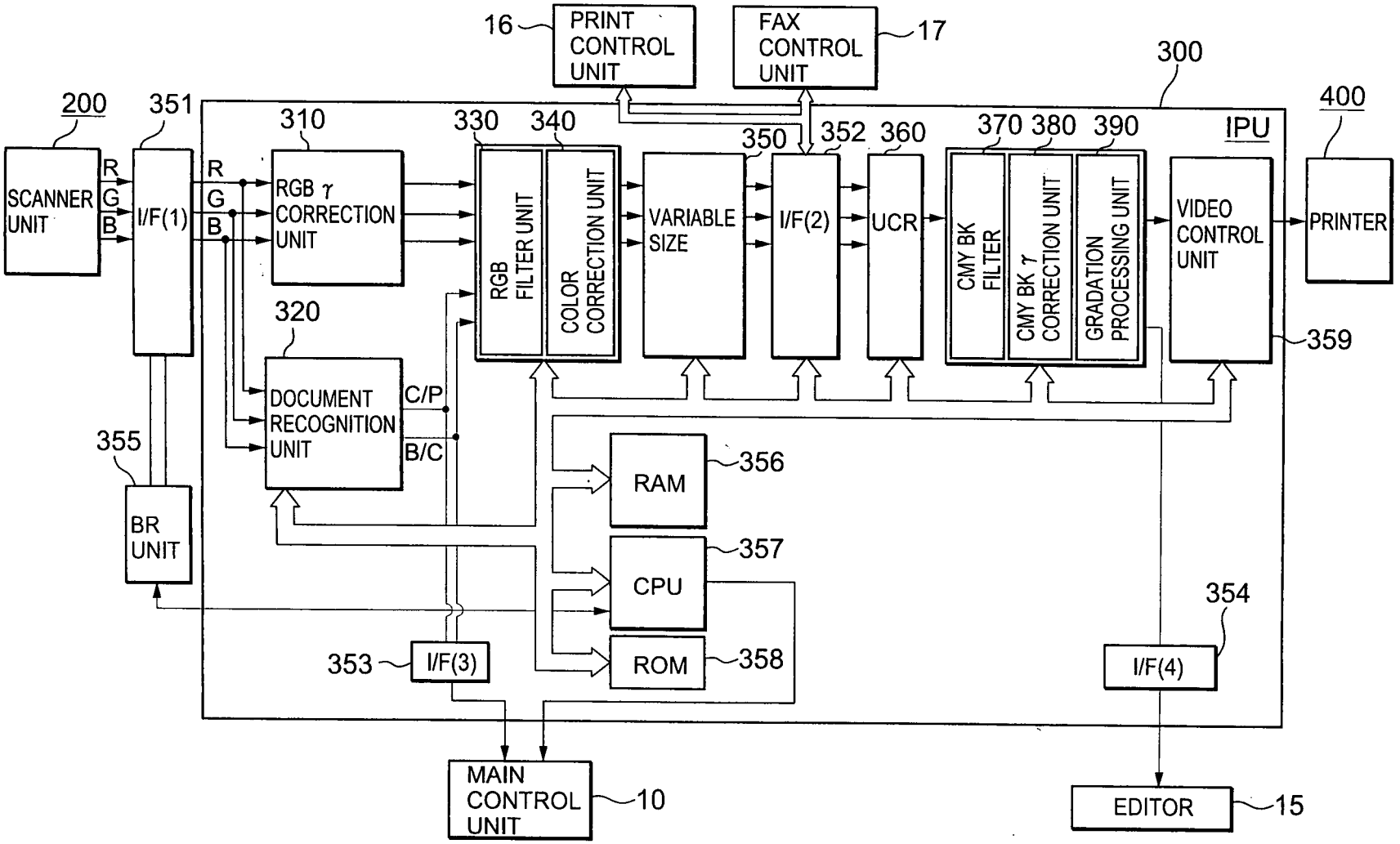



FIG.3

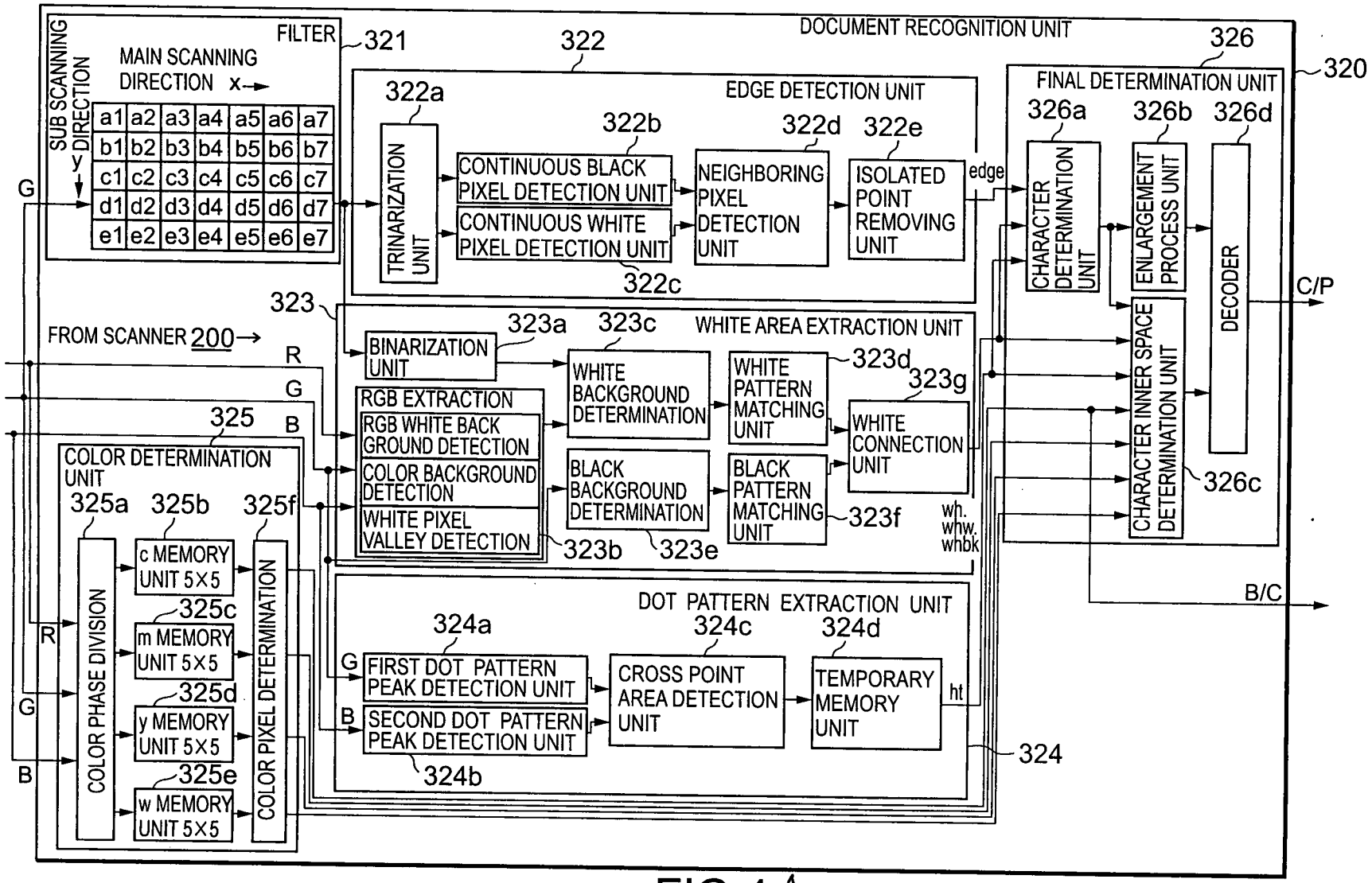

DOCUMENT RECOGNITION UNIT
320
FILTER
321
MAIN SCANNING DIRECTION x
SUB SCANNING DIRECTION y
a1 a2 a3 a4 a5 a6 a7
b1 b2 b3 b4 b5 b6 b7
c1 c2 c3 c4 c5 c6 c7
d1 d2 d3 d4 d5 d6 d7
e1 e2 e3 e4 e5 e6 e7
G
322
EDGE DETECTION UNIT
322a
TRINARIZATION UNIT
322b
CONTINUOUS BLACK PIXEL DETECTION UNIT
CONTINUOUS WHITE PIXEL DETECTION UNIT
322c
322d
NEIGHBORING PIXEL DETECTION UNIT
322e
ISOLATED POINT REMOVING UNIT
edge
326
FINAL DETERMINATION UNIT
326a
CHARACTER DETERMINATION UNIT
326b
ENLARGEMENT PROCESS UNIT
326d
DECODER
C/P
323
WHITE AREA EXTRACTION UNIT
FROM SCANNER 200
R
G
B
BINARIZATION UNIT
323a
323c
WHITE BACKGROUND DETERMINATION
WHITE PATTERN MATCHING UNIT
323d
323g
WHITE CONNECTION UNIT
RGB EXTRACTION
RGB WHITE BACK GROUND DETECTION
COLOR BACKGROUND DETECTION
WHITE PIXEL VALLEY DETECTION
323b
BLACK BACKGROUND DETERMINATION
323e
BLACK PATTERN MATCHING UNIT
323f
wh.
whw.
whbk
CHARACTER INNER SPACE DETERMINATION UNIT
326c
325
COLOR DETERMINATION UNIT
325a
325b
325f
COLOR PHASE DIVISION
c MEMORY UNIT 5×5
m MEMORY UNIT 5×5
y MEMORY UNIT 5×5
w MEMORY UNIT 5×5
325c
325d
325e
COLOR PIXEL DETERMINATION
B/C
DOT PATTERN EXTRACTION UNIT
324a
FIRST DOT PATTERN PEAK DETECTION UNIT
SECOND DOT PATTERN PEAK DETECTION UNIT
324b
324c
CROSS POINT AREA DETECTION UNIT
324d
TEMPORARY MEMORY UNIT
ht
324

FIG.4A

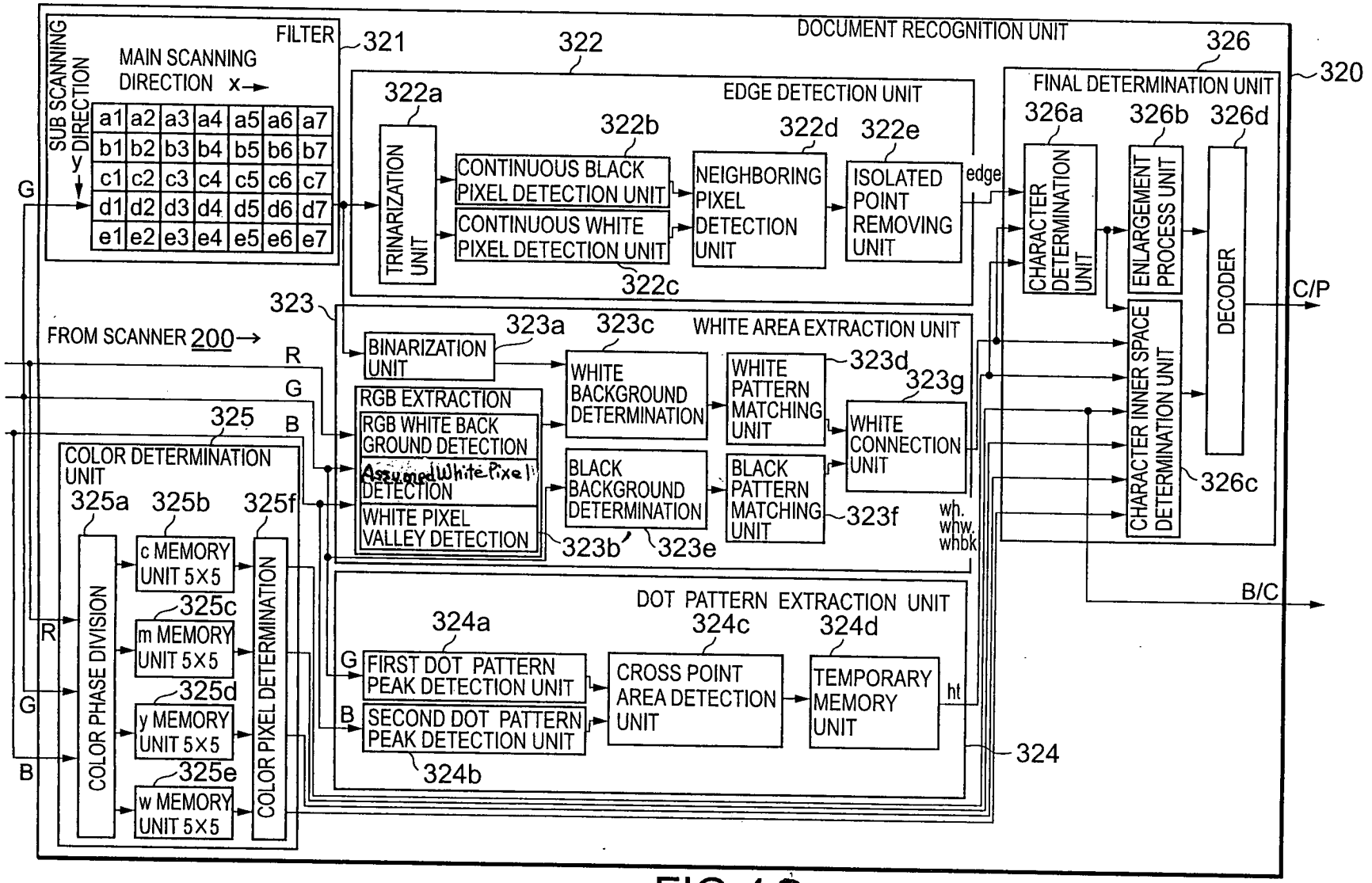
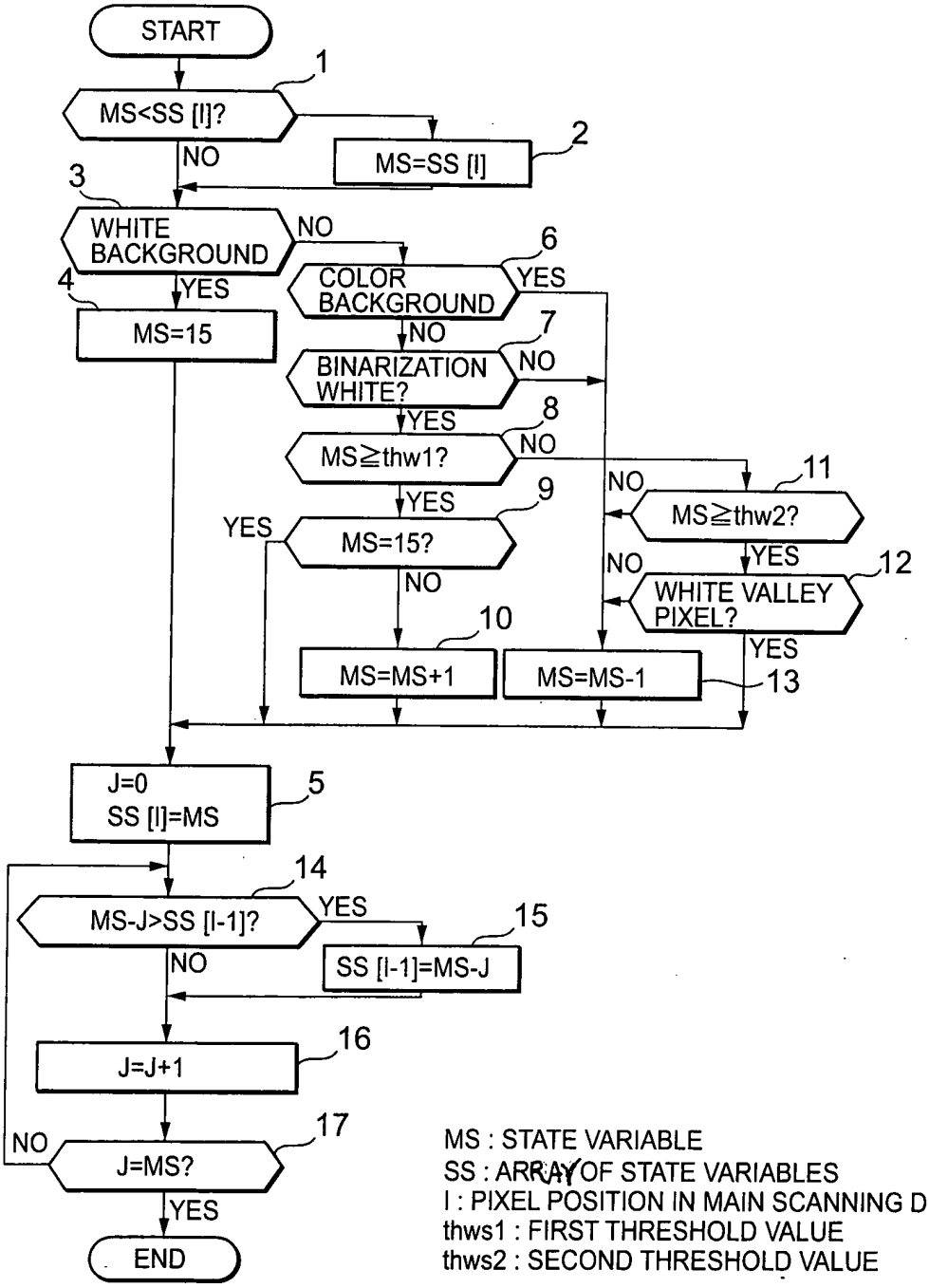

DOCUMENT RECOGNITION UNIT
320
FILTER
321
SUB SCANNING DIRECTION y
MAIN SCANNING DIRECTION x
a1 a2 a3 a4 a5 a6 a7
b1 b2 b3 b4 b5 b6 b7
c1 c2 c3 c4 c5 c6 c7
d1 d2 d3 d4 d5 d6 d7
e1 e2 e3 e4 e5 e6 e7
G
322
EDGE DETECTION UNIT
322a
TRINARIZATION UNIT
322b
CONTINUOUS BLACK PIXEL DETECTION UNIT
CONTINUOUS WHITE PIXEL DETECTION UNIT
322c
322d
NEIGHBORING PIXEL DETECTION UNIT
322e
ISOLATED POINT REMOVING UNIT
edge
326
FINAL DETERMINATION UNIT
326a
CHARACTER DETERMINATION UNIT
326b
ENLARGEMENT PROCESS UNIT
326d
DECODER
C/P
323
FROM SCANNER 200
R
G
B
BINARIZATION UNIT
323a
323c
WHITE AREA EXTRACTION UNIT
RGB EXTRACTION
RGB WHITE BACK GROUND DETECTION
Assumed White Pixel DETECTION
WHITE PIXEL VALLEY DETECTION
323b
WHITE BACKGROUND DETERMINATION
BLACK BACKGROUND DETERMINATION
323e
WHITE PATTERN MATCHING UNIT
323d
BLACK PATTERN MATCHING UNIT
323f
323g
WHITE CONNECTION UNIT
wh.
whw.
whbk
CHARACTER INNER SPACE DETERMINATION UNIT
326c
325
COLOR DETERMINATION UNIT
325a
325b
325f
COLOR PHASE DIVISION
c MEMORY UNIT 5×5
325c
m MEMORY UNIT 5×5
325d
y MEMORY UNIT 5×5
325e
w MEMORY UNIT 5×5
COLOR PIXEL DETERMINATION
B/C
DOT PATTERN EXTRACTION UNIT
324a
FIRST DOT PATTERN PEAK DETECTION UNIT
SECOND DOT PATTERN PEAK DETECTION UNIT
324b
324c
CROSS POINT AREA DETECTION UNIT
324d
TEMPORARY MEMORY UNIT
ht
324

FIG.4B




MS : STATE VARIABLE
SS : ARRAY OF STATE VARIABLES
I : PIXEL POSITION IN MAIN SCANNING DIRECTION
thws1 : FIRST THRESHOLD VALUE
thws2 : SECOND THRESHOLD VALUE

FIG.5A

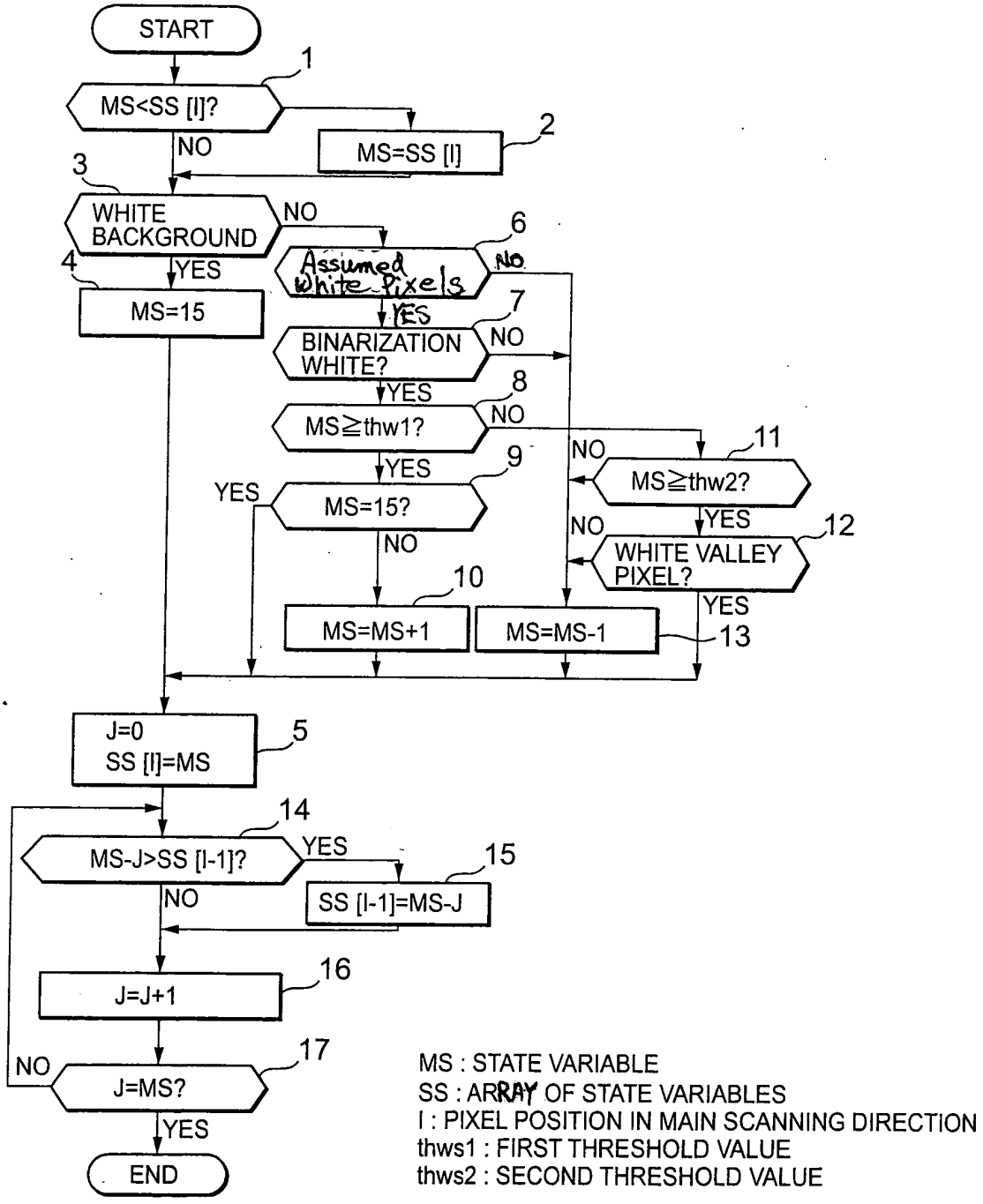

START
1
MS<SS [I]?
NO
2
MS=SS [I]
3
WHITE BACKGROUND
NO
6
Assumed White Pixels
NO
4
YES
MS=15
YES
7
BINARIZATION WHITE?
NO
YES
8
MS≧thw1?
NO
11
NO
MS≧thw2?
YES
9
YES
MS=15?
NO
NO
12
WHITE VALLEY PIXEL?
10
YES
MS=MS+1
MS=MS-1
13
J=0
SS [I]=MS
5
14
MS-J>SS [I-1]?
YES
15
NO
SS [I-1]=MS-J
16
J=J+1
17
NO
J=MS?
YES
END
MS : STATE VARIABLE
SS : ARRAY OF STATE VARIABLES
I : PIXEL POSITION IN MAIN SCANNING DIRECTION
thws1 : FIRST THRESHOLD VALUE
thws2 : SECOND THRESHOLD VALUE

FIG.5B

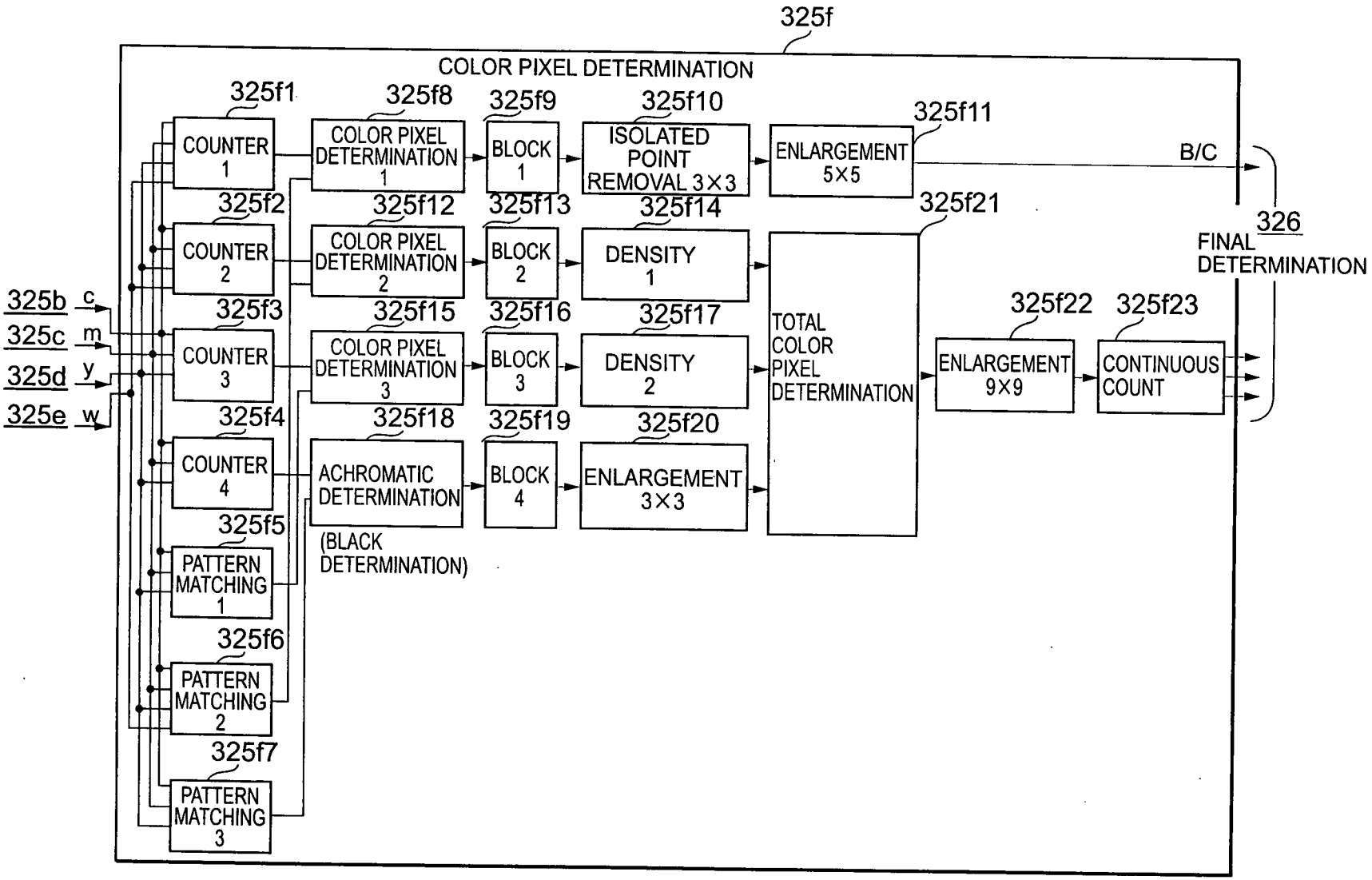

325f
COLOR PIXEL DETERMINATION
325f1
COUNTER 1
325f2
COUNTER 2
325f3
COUNTER 3
325f4
COUNTER 4
325f5
PATTERN MATCHING 1
325f6
PATTERN MATCHING 2
325f7
PATTERN MATCHING 3
325f8
COLOR PIXEL DETERMINATION 1
325f12
COLOR PIXEL DETERMINATION 2
325f15
COLOR PIXEL DETERMINATION 3
325f18
ACHROMATIC DETERMINATION
(BLACK DETERMINATION)
325f9
BLOCK 1
325f13
BLOCK 2
325f16
BLOCK 3
325f19
BLOCK 4
325f10
ISOLATED POINT REMOVAL 3×3
325f14
DENSITY 1
325f17
DENSITY 2
325f20
ENLARGEMENT 3×3
325f11
ENLARGEMENT 5×5
325f21
TOTAL COLOR PIXEL DETERMINATION
325f22
ENLARGEMENT 9×9
325f23
CONTINUOUS COUNT
B/C
326
FINAL DETERMINATION
325b c
325c m
325d y
325e w

FIG.6

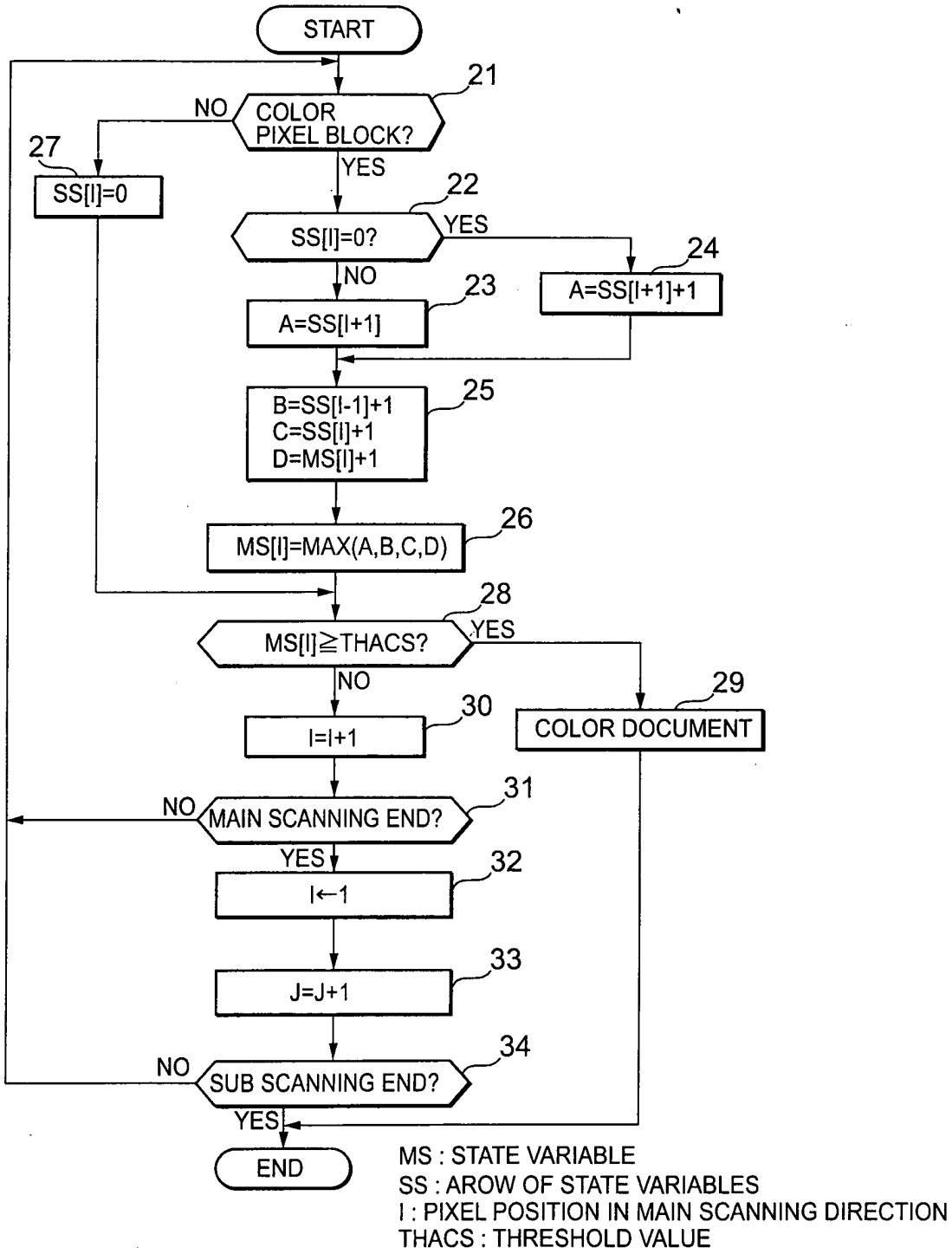
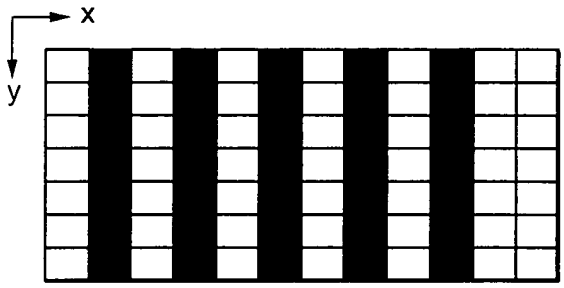

START
21
NO
COLOR PIXEL BLOCK?
YES
27
SS[I]=0
22
SS[I]=0?
YES
24
A=SS[I+1]+1
NO
23
A=SS[I+1]
25
B=SS[I-1]+1
C=SS[I]+1
D=MS[I]+1
26
MS[I]=MAX(A,B,C,D)
28
MS[I]≧THACS?
YES
29
COLOR DOCUMENT
NO
30
I=I+1
31
NO
MAIN SCANNING END?
YES
32
I←1
33
J=J+1
34
NO
SUB SCANNING END?
YES
END
MS : STATE VARIABLE
SS : AROW OF STATE VARIABLES
I : PIXEL POSITION IN MAIN SCANNING DIRECTION
THACS : THRESHOLD VALUE

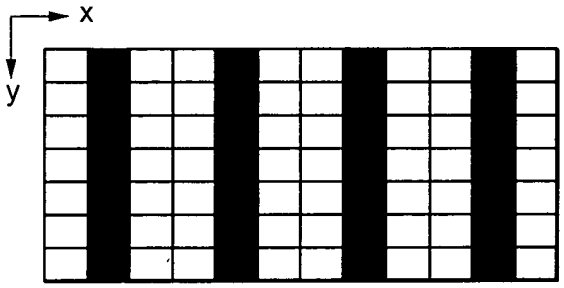
FIG.7

FIG.8A




PATTERN AT 600dpi

FIG.8B




PATTERN AT 400dpi

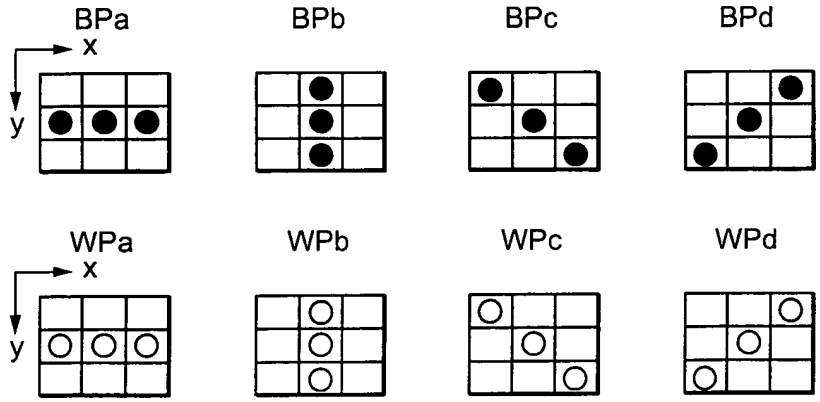



FIG.9

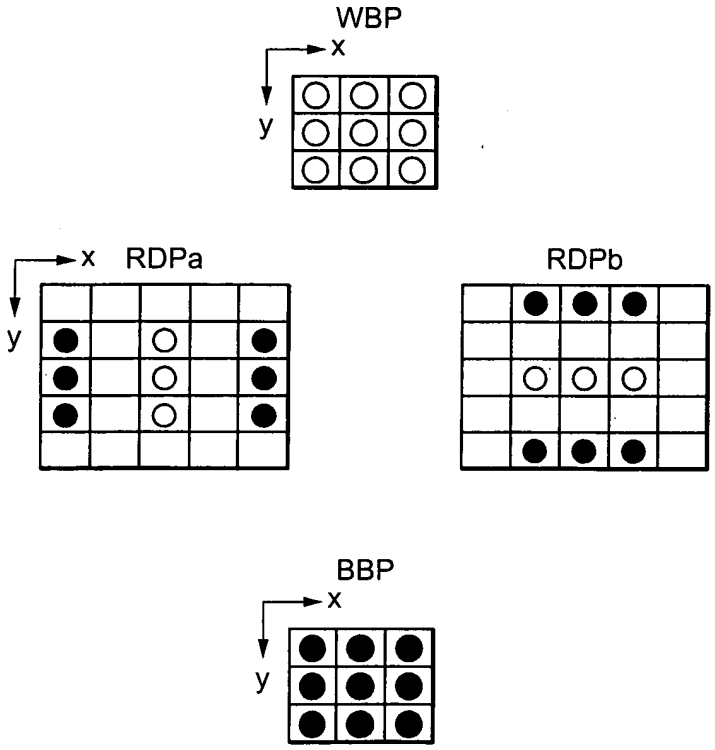

WBP
x
y
x
RDPa
y
RDPb
BBP
x
y

FIG.10

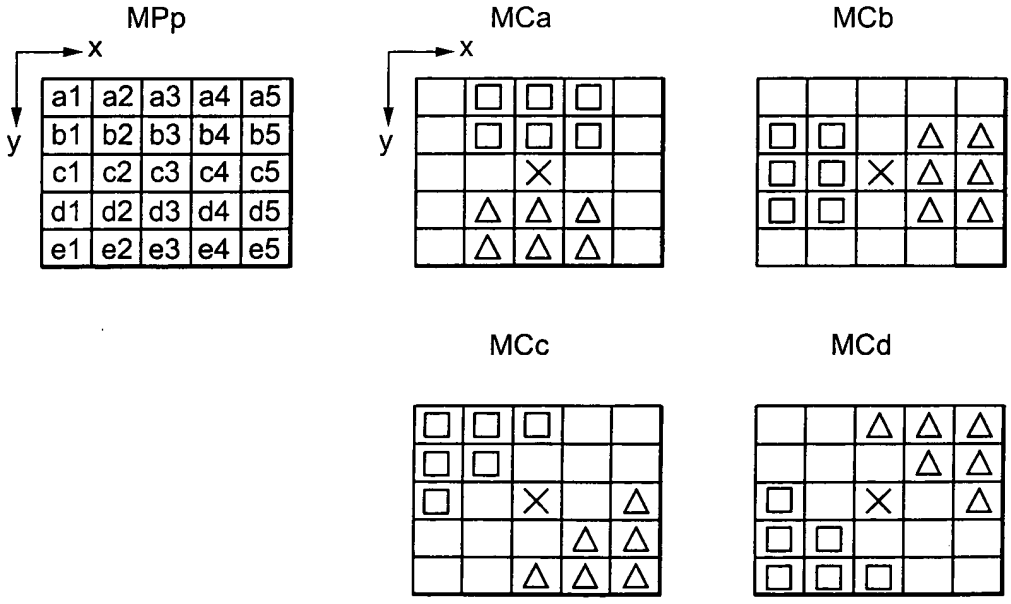

MPp
x
y
a1 a2 a3 a4 a5
b1 b2 b3 b4 b5
c1 c2 c3 c4 c5
d1 d2 d3 d4 d5
e1 e2 e3 e4 e5
MCa
x
y
MCb
MCc
MCd

FIG.11

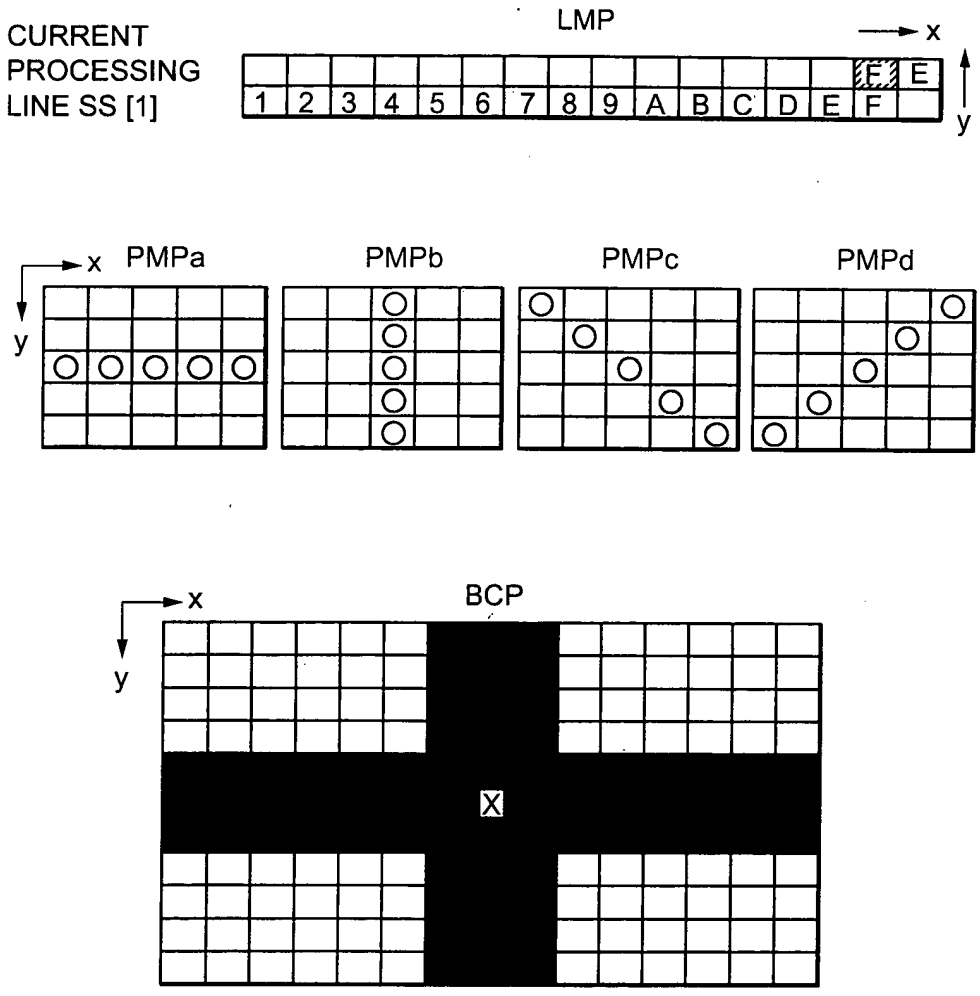

CURRENT
PROCESSING
LINE SS [1]
LMP
x
y
1 2 3 4 5 6 7 8 9 A B C D E F
PMPa
PMPb
PMPc
PMPd
BCP
X

FIG.12

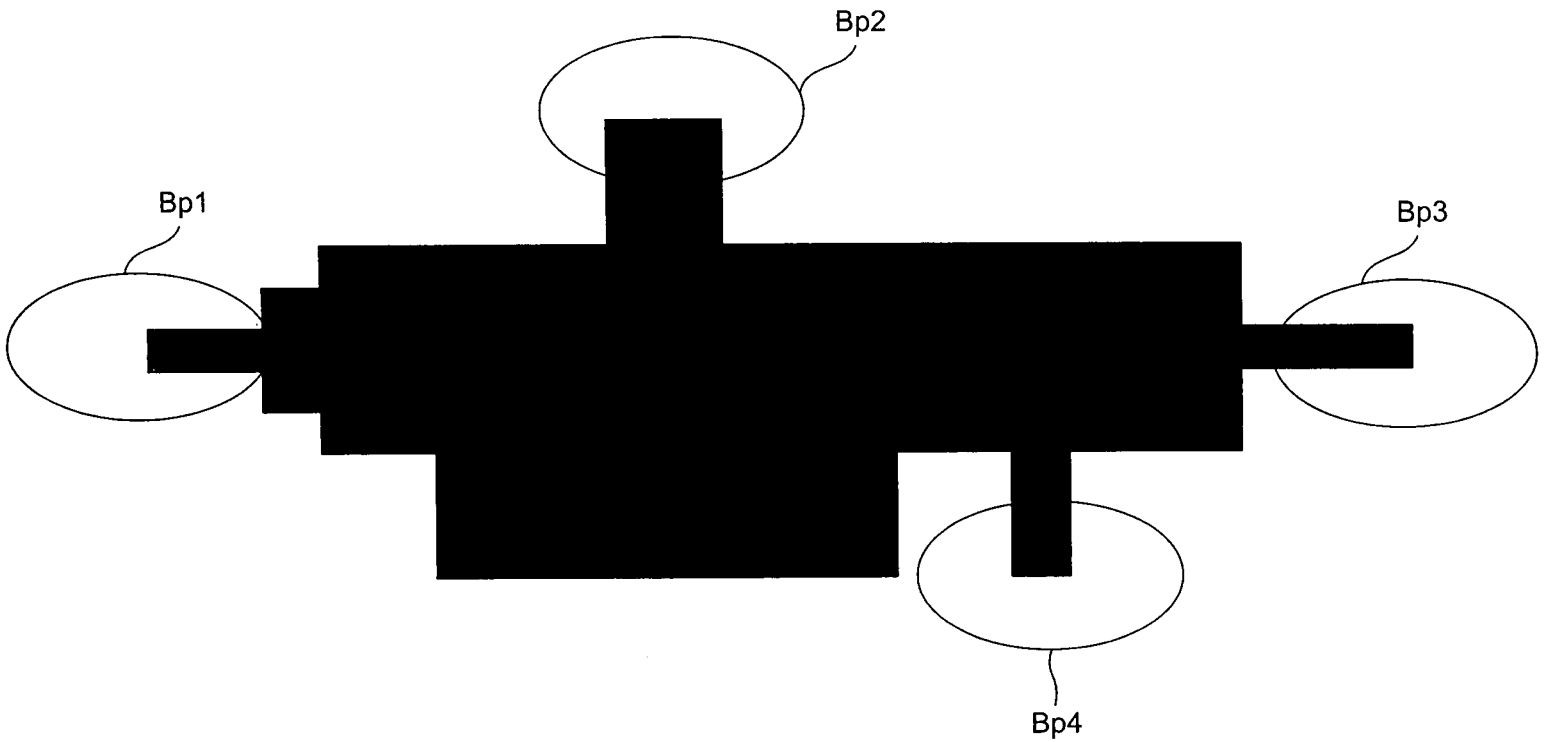



FIG.13

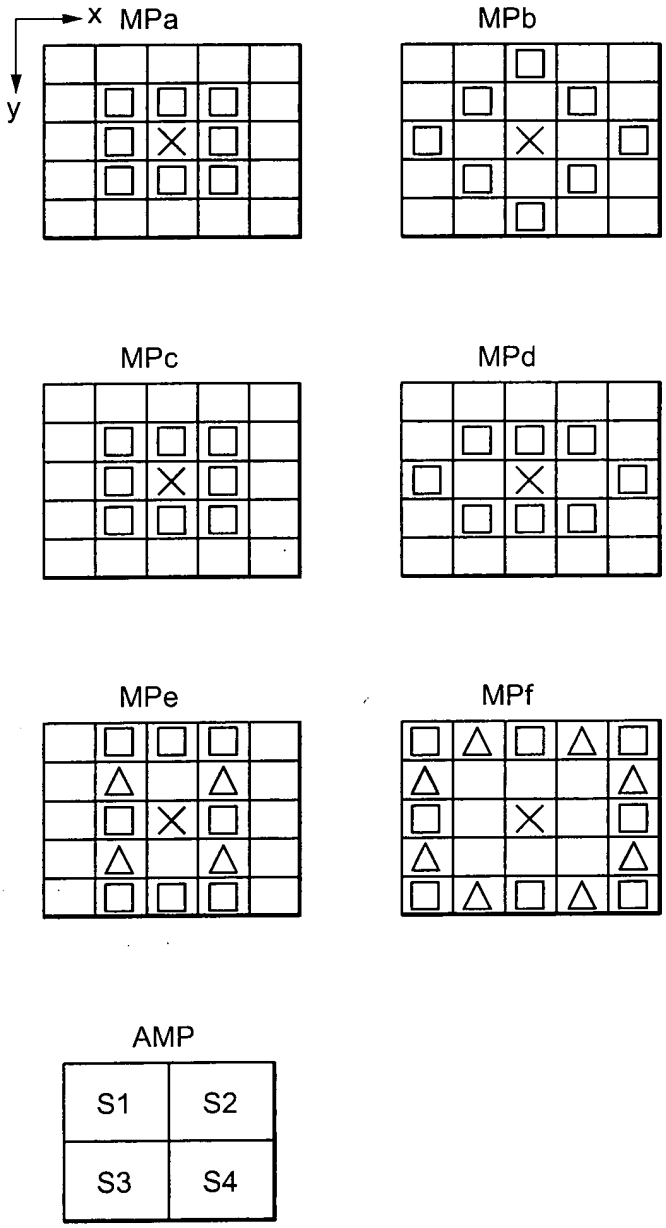



FIG.14

FIG.15A

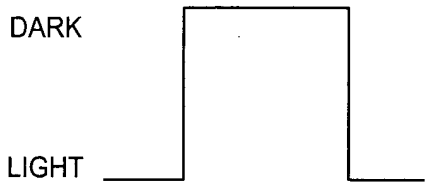



FIG.15B

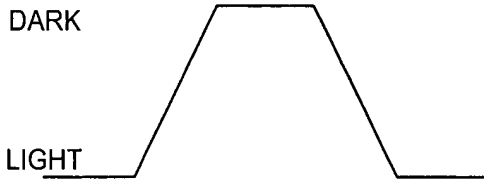
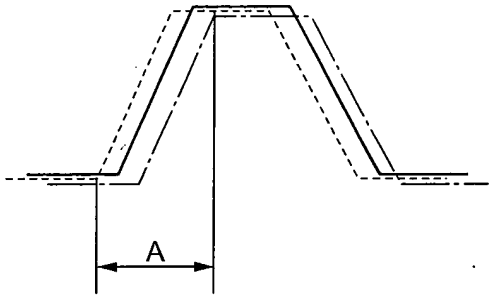



FIG.15C



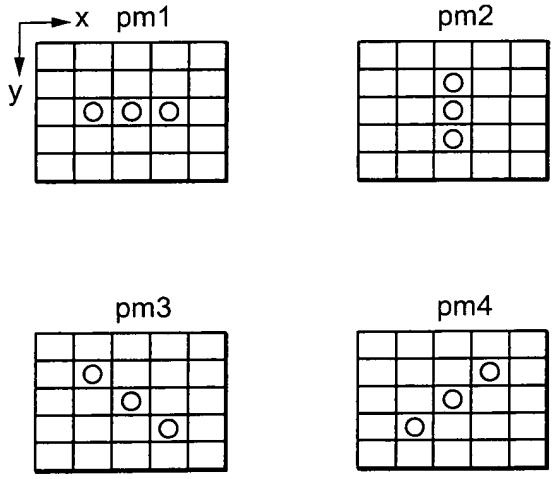




FIG.16

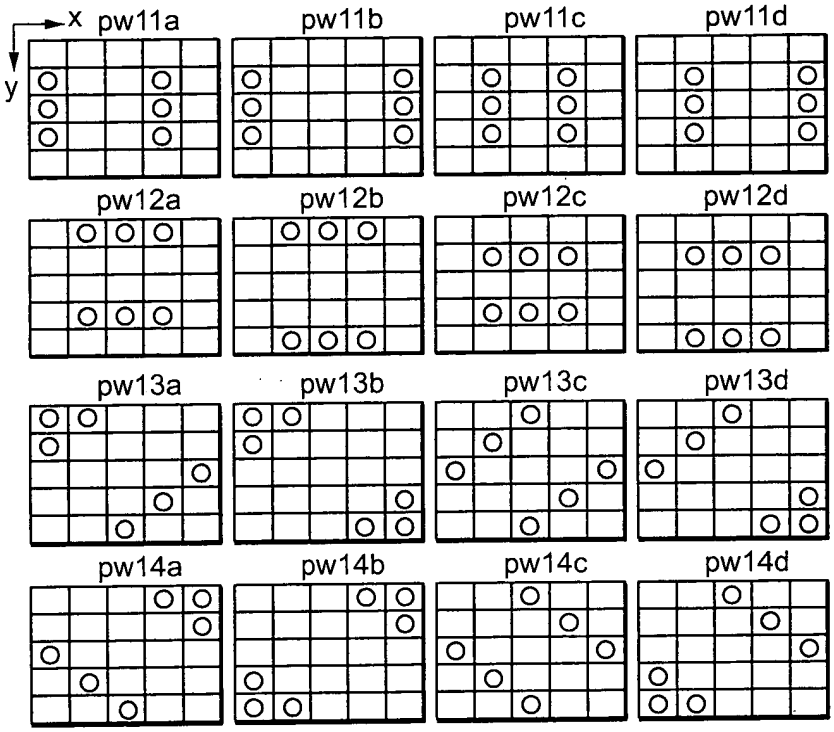

x
y
pw11a
pw11b
pw11c
pw11d
pw12a
pw12b
pw12c
pw12d
pw13a
pw13b
pw13c
pw13d
pw14a
pw14b
pw14c
pw14d

FIG.17

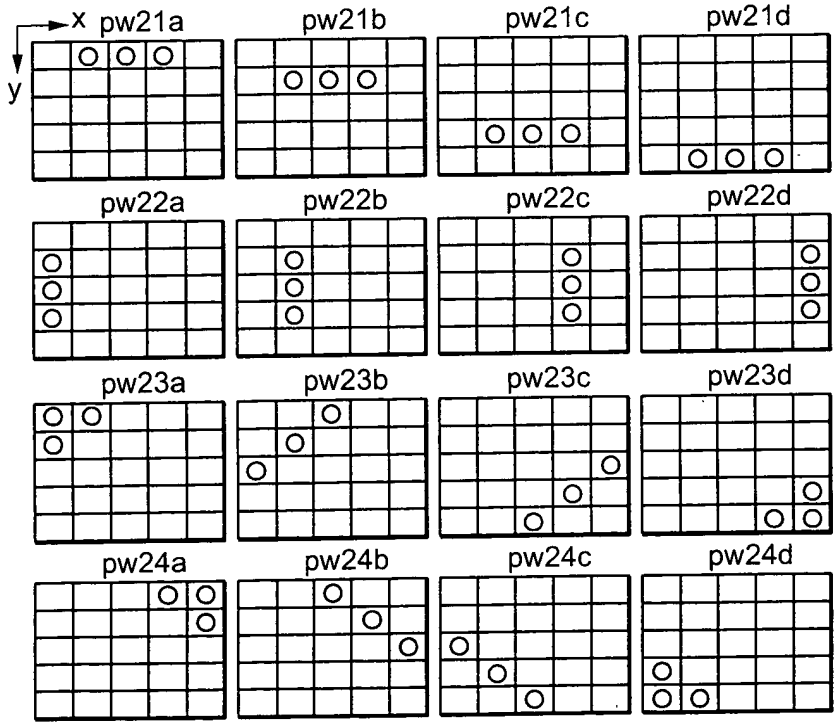
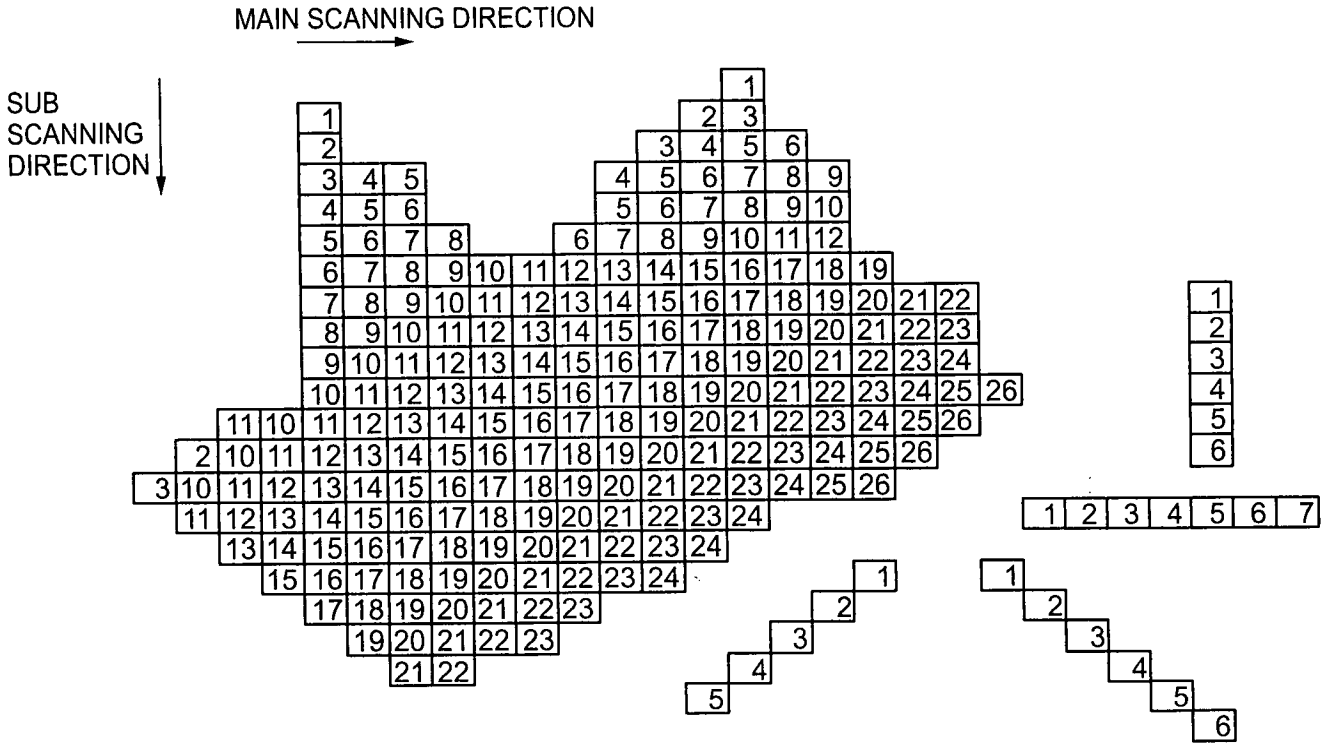

x
y
pw21a
pw21b
pw21c
pw21d
pw22a
pw22b
pw22c
pw22d
pw23a
pw23b
pw23c
pw23d
pw24a
pw24b
pw24c
pw24d

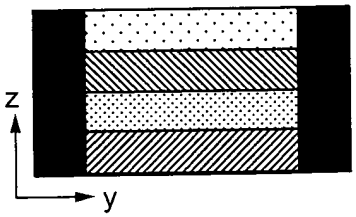
FIG.18




| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |

FIG.19

FIG.20(A)




:Y COMPONENT IN BLACK IN PHOTOGRAPHIC MODE
:M COMPONENT IN BLACK IN PHOTOGRAPHIC MODE
:C COMPONENT IN BLACK IN PHOTOGRAPHIC MODE
:BK (GRAY) COMPONENT IN BLACK IN PHOTOGRAPHIC MODE
:BK (BLACK) COMPONENT IN BLACK IN PHOTOGRAPHIC MODE

FIG.20(B)

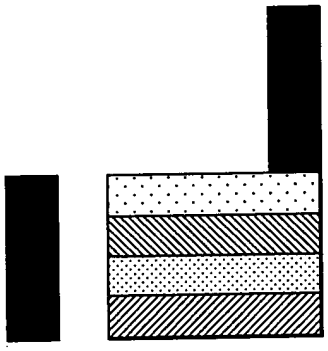


FIG.20(C)

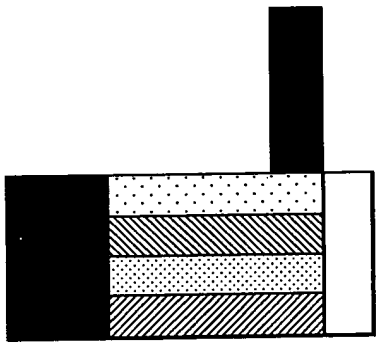


FIG.20(D)

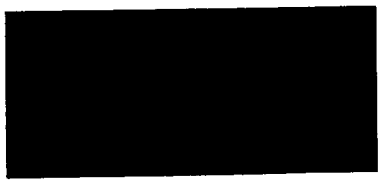


FIG.20(E)

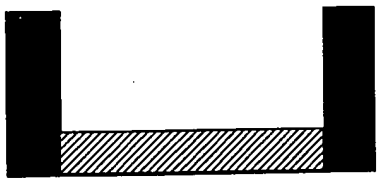


FIG.20(F)

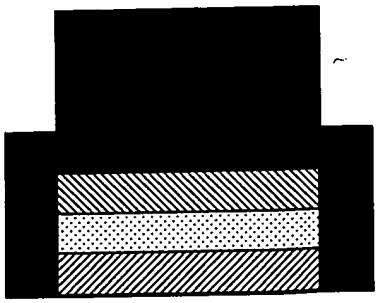


FIG.20(G)

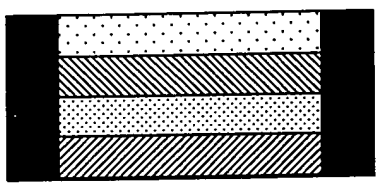


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FIG.21(A)

| | x1 | x2 | x3 | x4 |
|---|---|---|---|---|
| y1 | | | | |
| y2 | A21 | A22 | A23 | A24 |

FIG.21(B)

| | x1 | x2 | x3 | x4 |
|---|---|---|---|---|
| y1 | | | | |
| y2 | | | | B24 |

FIG.21(C)

| | x1 | x2 | x3 | x4 |
|---|---|---|---|---|
| y1 | | | | |
| y2 | | | | C24 |

FIG.21(D)

| | x1 | x2 | x3 | x4 | |
|---|---|---|---|---|---|
| y1 | | | Q13 | Q14 | Q15 |
| y2 | | | Q23 | Q24 | |

CURRENT PIXEL